

In the special forecast for the week beginning June 27 it was stated that generally fair weather was indicated for the greater part of the country during the week, and that such rains as might occur would be confined mostly to the central valleys, the Southern States, and the Lake region. It was forecast

that the week would give temperatures above the normal in all regions east of the Rocky Mountains, and temperatures slightly below the normal on the Pacific coast and in the Rocky Mountain and Plateau regions. The conditions recorded agreed closely with those forecast.

## RIVERS AND FLOODS.

By Prof. H. C. FRANKENFIELD, in charge River and Flood Division.

The floods that occurred during the month were confined to the smaller rivers of the country. They were of the usual short duration and were due to excessive precipitation over their immediate watersheds. The most important were those that occurred in Maryland, Virginia, and the Carolinas about the middle of the month.

Heavy rains over the headwaters of the Shenandoah and Potomac rivers from June 10 to 19, inclusive, forced these rivers above flood stages, and considerable damage was done, especially in the vicinity of Cumberland, Md., and along the south branch of the Potomac River, where the railroads suffered heavy losses from washouts of tracks and bridges, and from temporary suspension of business.

A rise of 19.2 feet in 24 hours in the Shenandoah River at Riverton, Va., brought the stage to 24.8 feet, or 2.8 feet above the flood stage, at that place on the morning of June 17. The river fell almost as rapidly, however, and by the morning of June 19 the stage was 6.0 feet. Considerable damage to growing crops resulted.

At Cumberland, Md., on the Potomac River, the crest stage of 9.6 feet, 1.6 foot above flood stage, occurred at 2 p. m., June 19, and the river was out of its banks and playing havoc with railroads and crops for miles above and below that place. At Harpers Ferry, W. Va., the river reached 19.8 feet, 1.8 foot above flood stage, on June 17. The crest stage of 7.4 feet at Washington, D. C., on June 18, caused considerable damage to small craft along the river front, many small boats being torn from their moorings and sunk.

The heavy rains also extended over the western slopes of the Appalachians, causing floods in the Monongahela River and its tributaries, and decided rises in the Licking and Kentucky rivers, with flood stages in the former. Damage to the amount of about \$100,000 was done in the vicinity of Elkins, W. Va., about equally divided between the railroads and the farmers, and as much more along the Monongahela River.

A general rainy period which set in over the watershed of the James River of Virginia, on June 12, caused that stream to overflow its banks from June 14 to 18, inclusive, and considerable damage to crops resulted therefrom. At Buchanan, Va., the crest stage of 15.6 feet was reached on June 14; at Columbia, Va., a stage of 26.0 feet, 8 feet above flood stage, occurred at 9 p. m., June 16, and at Richmond, Va., the highest point reached was 14.1 feet, 4.1 feet above the flood stage, on June 18. Warnings were issued in ample time for precautions to be taken and portable property and live stock were removed to places of safety. It is estimated that about \$35,000 was saved in this manner.

Weather conditions very similar to those over Virginia prevailed over the Carolinas from about June 5 to 17, inclusive, and continuous showers, interspersed with heavy downpours, gradually raised the Cape Fear, the Tar, and the lower Roanoke rivers to heights above the flood stage. Timely warnings issued by the Weather Bureau permitted the removal of stock, etc., likely to be endangered, and it is estimated that about \$50,000 worth of property was saved through the proper observance of these advices. Damage to crops to the extent of about

\$200,000 was caused by the floods, chiefly in the Tar River lowlands.

Similar conditions prevailed in the Pedee, Wateree, and Santee rivers of South Carolina. At Cheraw, S. C., on the Pedee River, the crest stage was 31.8 feet, 4.8 feet above the flood stage, on June 16, and at Smiths Mills, S. C., 14.2 feet, 1.8 foot below the flood stage, on June 24. There was no damage of consequence, and the flood was really very beneficial to lumber interests, as it enabled them to float to market large quantities of logs that had been lying dry since the summer of 1909.

The Wateree River rose to 27.4 feet at Camden, S. C., 3.4 feet above the flood stage, on June 15, and crops along the river to the value of about \$14,000 were destroyed. Losses from other sources were minimized by warnings issued by the Weather Bureau, and it is estimated that property to the value of \$26,000 was saved through their proper observance.

The Santee River was also above flood stage without damage of consequence.

At Blue Rapids, Kans., the Blue River rose 14.7 feet in 24 hours, reaching a stage of 21.5 feet, or 7.5 feet above the flood stage, on June 9. This rise was caused by excessive local rains on June 7 and 8, and was not so pronounced over other portions of the river, although for a short time conditions were somewhat alarming in the vicinity of Marysville, Kans.

Along the Osage River the heavy rains were more general and flood stages were slightly exceeded.

The Arkansas River was low for the season, and at Wichita, Kans., the stage of 3.3 feet below zero on June 30, was the lowest stage of record.

Owing to the dry season in that section, the Mississippi River above the mouth of the Missouri was low throughout the month, but below Alton, Ill., the stages were more in keeping with the time of year. Good stages also prevailed in the Ohio River, and in the Missouri River east of the State of Montana.

Heavy showers occurred during the early evening of June 17, in the lower Paradise Valley, 18 miles northeast of Phoenix, Ariz. The area affected was probably not over 25 square miles in extent, but the amount of rainfall was estimated at between 2.50 and 3.50 inches, of which at least 1.50 inch fell between 4:30 and 6:00 p. m. The Arizona Canal at Indian Head, on the Pima Indian Reservation, was washed out in 21 places, and there was a rise of 2.3 feet in the Salt River at Tempe, Ariz., during the early morning of June 28. There was no loss of life, but a number of horses and cattle were lost. Notice of the rise was sent out to all interested.

The rivers of the Pacific were low as had been previously forecast, and at some places along the Sacramento River the stages were the lowest of record for the season of the year.

Hydrographs for typical points on several principal rivers as shown on Chart I. The stations elected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.